What is claimed is:

1. A fluid mixing device for mixing a fluid having a fluid kinematic viscosity ν, comprising:

a core member having an outer surface and a longitudinal axis; and

a channel formed in the outer surface for receiving the fluid, wherein the channel includes at least one radial mixing turn and a plurality of axial mixing turns through which the fluid flows;

wherein the fluid flowing through the channel is mixed by the radial and axial mixing turns.

2. The fluid mixing device of claim 1, wherein the channel forms a fluid path that has a diameter D, and wherein for each of the radial and axial mixing turns, the fluid flows through the mixing turn with a velocity U and the mixing turn has a radius of curvature R such that $(U \cdot D/\nu)(D/2 \cdot R)^{1/2}$ is at least about 10.

3. The fluid mixing device of claim 2, wherein for each of the radial and axial mixing turns, the radius of curvature R thereof is at least $2 \cdot D$.

4. The fluid mixing device of claim 2, wherein the radial and axial mixing turns all have substantially the same radius of curvature R and substantially the same diameter D.

5. The fluid mixing device of claim 1, further comprising:

a hollow mixing tube disposed in the channel, wherein the mixing tube forms a fluid path that has a diameter D and traverses the radial and axial mixing turns, wherein for each of the radial and axial mixing turns, the fluid flows through the mixing turn with a velocity U and the mixing turn has a radius of curvature R such that $(U \cdot D/\nu)(D/2 \cdot R)^{1/2}$ is at least about 10.

6. The fluid mixing device of claim 5, wherein for each of the radial and axial mixing turns, the radius of curvature R thereof is at least 2 • D.

7. The fluid mixing device of claim 5, wherein the radial and axial mixing turns all have substantially the same radius of curvature R and substantially the same diameter D.

8. The fluid mixing device of claim 1, wherein the plurality of axial mixing turns includes at least two different degrees of rotation.

9. The fluid mixing device of claim 8, wherein the at least two different degrees of rotation include substantially 90 degrees and substantially 180 degrees.

10. The fluid mixing device of claim 1, wherein the plurality of axial mixing turns includes both clockwise and counterclockwise directions of rotation.

11. The fluid mixing device of claim 1, wherein the at least one radial mixing turn includes a plurality of radial mixing turns.

12. The fluid mixing device of claim 11, wherein the plurality of radial mixing turns includes both clockwise and counterclockwise directions of rotation.

13. The fluid mixing device of claim 11, wherein the channel includes:

first portions where one of the radial mixing turns and one of the axial mixing turns overlap each other, and

second portions each with one of the radial mixing turns but none of the axial mixing turns.

14. The fluid mixing device of claim 13, wherein the channel further includes:

third portions that are substantially linear.

15. A particle analyzer, comprising:

a source of specimen fluid;

a flow cell;

a mixing device that includes:

a core member having an outer surface and a longitudinal axis, and

a channel formed in the outer surface having at least one radial mixing turn and a plurality of axial mixing turns; and

a pump for pumping the specimen fluid from the specimen fluid source, through the mixing device wherein the specimen fluid flowing through the channel undergoes mixing by the radial and axial mixing turns, and then to the flow cell.

16. The particle analyzer of claim 15, further comprising:

a source of stain; and

a dispensing valve for injecting the stain from the stain source into the specimen fluid, wherein the stain and specimen fluid are mixed together by the mixing device.

17. The particle analyzer of claim 16, wherein:

the channel forms a fluid path that has a diameter D;

the specimen fluid has a fluid kinematic viscosity ν; and

for each of the radial and axial mixing turns, the specimen fluid and stain flows through the mixing turn with a velocity U and the mixing turn has a radius of curvature R such that $(U \cdot D/\nu)(D/2 \cdot R)^{1/2}$ is at least about 10.

18. The particle analyzer of claim 17, wherein for each of the radial and axial mixing turns, the radius of curvature R thereof is at least $2 \cdot D$.

19. The particle analyzer of claim 17, wherein the radial and axial mixing turns all have substantially the same radius of curvature R and substantially the same diameter D.

20. The particle analyzer of claim 16, further comprising:

a hollow mixing tube disposed in the channel, wherein:

the mixing tube forms a fluid path that has a diameter D and traverses the radial and axial mixing turns,

the specimen fluid has a fluid kinematic viscosity ν, and

for each of the radial and axial mixing turns, the fluid flows through the mixing turn with a velocity U and the mixing turn has a radius of curvature R such that $(U \cdot D/\nu)(D/2 \cdot R)^{1/2}$ is at least about 10.

21. The particle analyzer of claim 20, wherein for each of the radial and axial mixing turns, the radius of curvature R thereof is at least 2 • D.

22. The particle analyzer of claim 20, wherein the radial and axial mixing turns all have substantially the same radius of curvature R and substantially the same diameter D.

23. The particle analyzer of claim 15, wherein the plurality of axial mixing turns includes at least two different degrees of rotation.

24. The particle analyzer of claim 23, wherein the at least two different degrees of rotation include substantially 90 degrees and substantially 180 degrees.

25. The particle analyzer of claim 15, wherein the plurality of axial mixing turns includes both clockwise and counterclockwise directions of rotation.

26. The particle analyzer of claim 15, wherein the at least one radial mixing turn includes a plurality of radial mixing turns.

27. The particle analyzer of claim 26, wherein the plurality of radial mixing turns includes both clockwise and counterclockwise directions of rotation.

28. The particle analyzer of claim 16, wherein the channel includes:

first portions where one of the radial mixing turns and one of the axial mixing turns overlap each other, and

second portions each with one of the radial mixing turns but none of the axial mixing turns.

29. The particle analyzer of claim 28, wherein the channel further includes:

third portions that are substantially linear.

30. The particle analyzer of claim 17, further comprising:

hollow tubing for conveying the specimen fluid from the mixing device to the flow cell;

wherein the specimen fluid pumped through the mixing device at the velocity U flows into the hollow tubing; and

wherein the pump then pumps specimen fluid from the specimen fluid source through the mixing device at a velocity X which is less than velocity U, where $(X \cdot D/\nu)(D/2 \cdot R)^{1/2}$ is less than about 10.

31. The particle analyzer of claim 30, wherein as the specimen fluid is pumped through the mixing device at the velocity X, the specimen fluid that flowed through the mixing device at the velocity U flows through the flow cell.

32. The particle analyzer of claim 30, further comprising:

an imager for capturing images of the specimen fluid flowing through the flow cell, wherein the imager captures images of the specimen fluid that flowed through the mixing

device at velocity U, but ceases the capturing of images before the specimen fluid that flowed through the mixing device at velocity X reaches the flow cell.

33. The particle analyzer of claim 20, further comprising:

hollow tubing for conveying the specimen fluid from the mixing device to the flow cell;

wherein the specimen fluid pumped through the mixing device at the velocity U flows into the hollow tubing; and

wherein the pump then pumps specimen fluid from the specimen fluid source through the mixing device at a velocity X which is less than velocity U, where $(X \bullet D/\nu)(D/2 \bullet R)^{1/2}$ is less than about 10.

34. The particle analyzer of claim 33, wherein as the specimen fluid is pumped through the mixing device at the velocity X, the specimen fluid that flowed through the mixing device at the velocity U flows through the flow cell.

35. The particle analyzer of claim 33, further comprising:

an imager for capturing images of the specimen fluid flowing through the flow cell, wherein the imager captures images of the specimen fluid that flowed through the mixing device at velocity U, but ceases the capturing of images before the specimen fluid that flowed through the mixing device at velocity X reaches the flow cell.

36. The particle analyzer of claim 17, further comprising:

a source of rinsing fluid having a kinematic viscosity of ν_2;

means for pumping the rinsing fluid through the radial and axial mixing turns with a velocity U_2 such that $(U_2 \bullet D/\nu_2)(D/2 \bullet R)^{1/2}$ is at least about 10.

37. A fluid mixing device for mixing a fluid having a fluid kinematic viscosity ν, comprising:

a hollow mixing tube disposed about a longitudinal axis for receiving the fluid, wherein the mixing tube forms a fluid path having at least one radial mixing turn and a plurality of axial mixing turns through which the fluid flows;

wherein the fluid flowing through the fluid path is mixed by the radial and axial mixing turns.

38. The fluid mixing device of claim 37, wherein the fluid path has a diameter D, and wherein for each of the radial and axial mixing turns, the fluid flows through the mixing turn with a velocity U and the mixing turn has a radius of curvature R such that $(U \bullet D/\nu)(D/2 \bullet R)^{1/2}$ is at least about 10.

39. The fluid mixing device of claim 38, wherein for each of the radial and axial mixing turns, the radius of curvature R thereof is at least 2 • D.

40. The fluid mixing device of claim 38, wherein the radial and axial mixing turns all have substantially the same radius of curvature R and substantially the same diameter D.

41. The fluid mixing device of claim 37, wherein the plurality of axial mixing turns includes at least two different degrees of rotation.

42. The fluid mixing device of claim 41, wherein the at least two different degrees of rotation include substantially 90 degrees and substantially 180 degrees.

43. The fluid mixing device of claim 37, wherein the plurality of axial mixing turns includes both clockwise and counterclockwise directions of rotation.

44. The fluid mixing device of claim 37, wherein the at least one radial mixing turn includes a plurality of radial mixing turns.

45. The fluid mixing device of claim 44, wherein the plurality of radial mixing turns includes both clockwise and counterclockwise directions of rotation.

46. The fluid mixing device of claim 44, wherein the mixing tube includes:

first portions where one of the radial mixing turns and one of the axial mixing turns overlap each other, and

second portions each with one of the radial mixing turns but none of the axial mixing turns.

47. The fluid mixing device of claim 46, wherein the mixing tube further includes third portions that are substantially linear.

48. A sensor for detecting the presence of fluid in a hollow tube, the sensor comprising:

a first sensor circuit having an input for receiving an oscillating signal, an output, and a capacitor, wherein the first capacitor includes first and second electrodes, and wherein a portion of the hollow tube extends between the first and second electrodes,

a second sensor circuit having an input for receiving the oscillating signal, an output, and a reference capacitor;

wherein a voltage difference between the first sensor circuit output and the second sensor circuit output varies depending upon the presence or absence of fluid in the portion of the hollow tube between the first and second electrodes.

49. The sensor of claim 48, further comprising:

a comparator connected between the first and second sensor circuit outputs for producing an output signal in response to the voltage difference therebetween.

50. The sensor of claim 49, wherein:

the first RC circuit further includes a first resistor between the first sensor circuit input and the first electrode;

the second electrode is connected to a ground potential;

the second RC circuit further includes a second resistor between the second sensor circuit input and the reference capacitor; and

the reference capacitor is connected between the second resistor and the ground potential.

51. The sensor of claim 48, wherein:

the second sensing circuit has a time constant that is selected to be substantially the same as that of the first sensing circuit at a predetermined capacitance level.